STATUS REPORT:

LEPTONYCTERIS SANBORNI HOFFMEISTER

Sanborn's long-nosed bat

Prepared for:

Office of Endangered Species
U.S. Fish and Wildlife Service
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STATUS REPORT

Taxon Name: Leptonycteris sanborni Hoffmeister

Common Name: Sanborn's long-nosed bat

Family: Phyllostomidae

Distribution:

United States:
- Arizona
- New Mexico

Mexico:
- Baja California Norte
- Baja California Sur
- Colima
- Chiapas
- Chihuahua
- Distrito Federal
- Durango
- Guerrero
- Hidalgo
- Jalisco
- Mexico
- Michoacan
- Morelos
- Nayarit
- Nuevo Leon
- Oaxaca
- Puebla
- Queretaro
- San Luis Potosi
- Sinaloa
- Sonora
- Veracruz
- Zacatecas

Current Federal Status: None

Recommended Federal Status: Threatened

Investigator:

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Washington, D.C. 20560

I. SPECIES INFORMATION

Classification and Nomenclature

A. Scientific Name: Leptonycteris sanborni Hoffmeister

B. Original Publication: Hoffmeister, D. F. 1957. Review of the long-nosed bats of the Genus Leptonycteris. Journal of Mammalogy, 38:454-461.

C. Type Specimen: Adult female, No. 3888, University of Illinois Museum of Natural History, skin and skull; mouth of Miller Canyon, Huachuca Mountains, 10 mi. SSE Fort Huachuca, Cochise County, Arizona; collected August 18, 1950, by Donald F. Hoffmeister, original No. 1444.

D. Synonyms: Leptonycteris yerbabuenae Martinez and Villa

Common Name: Sanborn's Long-nosed bat

F. Family: Phyllostomidae

G. Subfamily: Glossophaginae

H. Taxon History: This species was not formally distinguished from L. nivalis until Martinez and Villa named L. yerbabuenae in 1940. Even then, confusion continued because the holotype was lost. When Hoffmeister named L. nivalis sanborni in 1957, he diagnosed it quite

well, but thought that it represented only a Western race of the widespread L. nivalis. Davis and Carter (1962) were the first to use the combination L. sanborni in the specific sense. Since that time, the two have been considered separate species. Neveretheless, many older specimens in museum collections are still labelled L. nivalis.

I. **Current Alternative Taxonomic Treatment:** Although the validity of the taxon we now know as L. sanborni is not in question, there has been a good deal of confusion over the relationships between this species and the closely related L. nivalis. Recent workers have agreed that two species exist, and the primary confusion has been over the correct name for L. sanborni.

The difficulty stems from the fact that the holotype on which the name yerbabuenae was based (Martinez and Villa, 1940) has been destroyed. The description and measurements led Davis and Carter (1962) to conclude that the name was based on specimens of nivalis, and they relegated yerbabuenae to the synonymy of nivalis on that basis. Ramirez-Pulido and Alvarez (1972) rediscovered part of the series of specimens on which the description was based, and although they confirmed that it contained both species, they selected a specimen of sanborni as a lectotype, and resurrected yerbabuenae as the correct specific epithet. Unfortunately, a lectotype can be designated from the type series only when a holotype was

not originally designated, so their action has no standing. Watkins et al. (1972) suggested that yerbabuenae should be considered a nomen dubium at best, or at least should remain in the synonymy of L. nivalis However, Hall (1981) chose to recognize yerbabuenae on the basis that Article 17(2) of the International Code of Zoological Nomenclature permits the use of a name proposed for one of a pair of species when the other species (L. nivalis in this case) of that pair can clearly be identified as previously named. At this time, my opinion is that the first name that can unequivocally be applied to the taxon in question is Leptonycteris sanborni Hoffmeister.

Curiously enough, during the course of this investigation, I examined two specimens in the Museum of Southwestern Biology at the University of New Mexico, collected in 1963 and 1967 in Guadalupe Canyon, Hidalgo Co., New Mexico, that are L. nivalis. This is surprising because it is the only record for this species outside of the state of Texas, and the only instance of sympatry between the two species in the northern part of their range. They do overlap extensively in the southern, or winter range. This means either that nivalis enjoys a much wider summer range than previously thought, or perhaps the two forms are not specifically distinct. A complete taxonomic revision would be worthwhile to solve this problem, as well as to provide a solution to the current nomenclatural dilemma, hopefully forever more.

Present Legal Status

A. International: None

B. National:

United States None

Mexico None

C. States:

Arizona None

Mexico None

Description

A. External Characters: These bats are striking compared to most other U.S. species, in that they have an elongated muzzle with a small nose leaf on the tip. Choeronycteris mexicana is similar in appearance, but has a broader interfemoral membrane, with a distinct tail. The length of the forearm is 51 to 56 mm. The tail is minute and appears to be lacking but actually consists of three vertebrae. The weight is usually 20 to 30 grams. These bats are usually yellowish brown or greyish above and cinnamon brown below (Nowak and Paradiso, 1983). The single most useful external character for separating this species from L. nivalis is the shorter, denser pelage and lack of hair extending above and beyond the tail membrane in contrast to the situation in L. nivalis.

B. Internal Characters: The genus Leptonycteris is characterized by dental features. The third molar is lacking and lower incisors are present. Only one other genus of bats, Lichonycteris, lacks a third molar, and

that genus also lacks lower incisors. The cheek teeth are elongate and slender. The long tongue (up to 76 mm extended) is covered by tiny papillae. The three phalanges of the third finger are normally longer than the third metacarpal. The forearm averages shorter (54) than that of L. nivalis, as does the skull (greatest length averages less than 27 mm). The presphenoid ridge is much longer in sanborni and the basisphenoidal pits shallower and less pronounced (Watkins et al., 1972). Phillips et al. (1969) and Jones and Genoways (1970) reported the presence in nivalis of pitting of the hard palate adjacent to the upper premolars and molars, and occasional loss of teeth, caused by a macronyssid mite that evidently does not parasitize sanborni (Radovsky et al. 1971).

C. **Local Field Characters:** The long muzzle and nose leaf immediately eliminate all species other than Choeronycteris mexicana. From that species, L. sanborni is distinguishable in the hand by a somewhat less elongated muzzle and the apparent lack of a tail. The two species of Leptonycteris can most easily be distinguished by the lack of fine hair extending beyond the interfemoral membrane in L. sanborni. Otherwise, the two species are extremely similar, and occasional specimens are quite difficult to identify.

Significance of Taxon

A. **Natural:** Leptonycteris sanborni used to be locally common and was an important component of low

desert ecosystems throughout western Mexico. Although it barely penetrates into the U.S. in southern Arizona and southern New Mexico, it may be critically important as a pollinator for various species of the plant genus Agave. Large colonies have been reported in the past, suggesting a major role in cave ecosystems where bat guano frequently provides the basis for a complex web of micro- and macro-organisms.

B. **Human:** The tequilla industry in Mexico is completely dependent on Agave plants. Small scale components of the industry rely on natural populations of Agave, which in turn are dependent upon L. sanborni for pollination. No economic detriments to humans in Mexico are known. No economic benefits or detriments to humans in the United States are known.

Current Research The objectives of the current study were to locate and census Leptonycteris sanborni in selected areas throughout their range and to evaluate threats to the species. The goal of the study was to determine the current status of the species.

The initial step was to contact the curators of the forty largest mammal collections in North America and to assemble a list of known specimens and localities. From this list, a three year plan was established to survey for this species and the closely related Leptonycteris nivalis.

Dirk V. Lanning and I, with help from Mexican colleagues Rodrigo Medellin and Hector Arita, surveyed localities in Texas, Nuevo Leon, Tamaulipas, Coahuila, and San Luis Potosi, from July 6 to August 4, 1983. We visited all known roosts, and most sites where either species of Leptonycteris had been mist-netted in the Sierra Madre Oriental and surrounding areas. Results of that effort are summarized in Wilson et al (1985).

Dirk Lanning and I, again with help from Medellin and Arita, as well as Alvaro Miranda, surveyed localities in the Distrito Federal, Mexico, Guerrero, Jalisco, Michoacan, Morelos, Sinaloa, Nayarit, and Sonora from May 10 to June 15, 1984. We completed our survey of known roosts of L. nivalis, and began a similar survey of L. sanborni roosts. In addition, we mist-netted almost every night.

Eugene H. Studier and I surveyed all known U. S. localities for L sanborni from 10 to 25 July, 1985. In addition to visiting every known roost and netting at all sites of previous capture, we interviewed biologists and conservation officials throughout the area to glean recent sightings or capture records not available in the published literature.

We traveled throughout Mexico in a field vehicle that allowed us access to almost all known localities of the species. We allowed our Mexican colleagues to work extensively with local inhabitants to locate little-known

caves in remote areas. Once in a cave, we established the presence of Leptonycteris by the characteristic yellow stains left by the droppings, and tried to count every individual in the roost.

Each night, we set 4-10 mist nets over likely water holes, either at known localities of occurrence, or near known roosts. All animals taken in the nets were carefully identified to species before releasing them.

During the course of the project, museum specimens were examined at the National Museum of Natural History, The University of New Mexico, The University of Arizona, and The Universidad Nacional Autonoma de Mexico.

Geographic Distribution

A. **Geographic Range:** Leptonycteris sanborni is known to occur from Glendale, Arizona (Constantine, 1966) southwards to Cintalapa, El Salvador (Hall, 1981). It also occurs in southwestern New Mexico, in the Peloncillo Mountains of Hidalgo County. Figure 1 shows the range of the species.

B. **Precise Occurrence:** The solid circles in Figure 1 denote marginal localities where L. nivalis has been collected in the past. Observations made during this survey are summarized in Table 1.

Habitat Description

A. **General:** Leptonycteris sanborni inhabits Upper and Lower Sonoran and Transition Life Zones at elevations ranging from sea level to over 5,000 ft. It is

probably one of the most arid adapted members of the subfamily glossophaginae (Koopman, 1981). In the northern parts of its range, L. sanborni is found in low desert scrub vegetation dotted with Agaves, mesquite, creosotebush, and a variety of cacti. In the Sierra Madre Occidental, they range upwards through pine-oak woodlands to ponderosa pine forests. Further south, they tend to encircle the Mexican plateau, extending all the way to the east coast where they frequently overlap with L. nivalis.

Vast areas of the northern part of the western coastal plain of Mexico remain in essentially natural vegetation, but in many of the lower areas, these bats may be limited by a lack of suitable cave roosting sites. Human habitations also tend to be concentrated in the coastal plain where climate, soils and topography are more suitable to agriculture.

The climate in the southern Arizona Mountains that comprise the U.S. habitat of this species is essentially hot and dry with occasional periods of summer rain. Maximum temperatures average around 30 degrees C when the bats are present. Temperatures are more variable in the Sierra Madre Occidental, where elevation plays a large role. In the southern and western parts of the range, climates are warm and dry with cool night time temperatures year round.

Leptonycteris are tropical bats, and probably unable to survive temperatures below 20 degrees centigrade for

extended periods of time (Hayward and Cockrum, 1971). Carpenter and Graham (1967) suggested that the lethal temperature is somewhere above 10 degrees C., depending on activity. Body temperature probably rises by five degrees or so during flight, and although they may allow their body temperature to fall to 23 degrees under experimental conditions, there is no ability to hibernate.

B. **Specific:** Although no detailed ecological distribution of these bats is available, it is possible to characterize the vegetation near current or historical roost sites (Hayward and Cockrum, 1971).

The Rincon Mountains just east of Tucson in Pima County, Arizona, held several former roost sites, including the well-known commercialized cave, Colossal Cave. On July 17, 1985, I located a former roost site in a box canyon with the help of Ronnie Sidner and Russell Davis of the University of Arizona. Although the cave itself is no longer used by L. nivalis, this area, at elevations between 3,000 and 4,000 ft., is dominated by saguaro cactus (Carnegia gigantea), palo verde (Cercidium microphyllum), and ocotillo (Fouquieria splendens). The understory is composed of a variety of desert shrubs, dominated by Agave schottii and prickly pear (Opuntia phaeacantha). Arroyos on the southern slopes have dense mesquite (Prosopis juliflora) thickets bordering them.

The Chiricahua Mountains in Cochise County used to house several colonies of L. sanborni in a variety of mine tunnels and natural caves. Gene Studier and I searched several of these on July 12 and 13, 1985. In this area, at elevations between 4,000 and 5,000 ft., an oak woodland dominated by Mexican blue oak (Quercus oblongifolia) covers the hillsides, where both Agave schottii and Agave palmeri occur, and ocotillo (Fouqueria splendens) is common. Here also the arroyos are often choked with dense mesquite (Prosopis juliflora) bosques. At lower elevations, the grasslands are interspersed with desert shrub communities dominated by creosote bush (Larrea tridentata) and cactus (Opuntia) of several species.

In northern Sonora, where these bats were formerly common in areas such as Cueva del Tigre near Carbo, the Lower Sonoran vegetation blends with subtropical thorn forest. Mesquite (Prosopis juliflora), ironwood (Olneya tesota), and palo verde (Cercidium microphyllum) form a low canopy at about 15 ft., especially around the arroyos. The understory is dominated by brittle bush (Encelia farinosa), and the commonest grass is side oats gramma (Bouteloua curtipendula). Showy emergents include cardon cactus (Lemaireocereus thurberi), morning glory tree (Ipomoea arborescens), arborescent ocotillo (Fouqueria macdougalli), and several species of cholla (Opuntia).

Many specimens in collections have come from the area around San Carlos Bay near Guaymas on the west coast of Sonora. The surrounding area is dominated by small outcrops that probably provide roosting sites, although I know of no caves in the area. The thorn forest here has a canopy at about 10 ft., and is dominated by Prosopis juliflora, Lysiloma divaricata, and Pithecellobium sonorae. A mixture of grasses interspersed with cardon cactus extends up the rocky outcrops, and the arroyos have scattered palms (Washingtonia) in addition to the usual species found further north. The coastline itself has extensive areas of mangrove forest, but I have never captured Leptonycteris in this habitat.

A series of abandoned silver mines near La Aduana in southern Sonora has yielded numerous specimens in the past. This area, at an elevation of about 1500 ft., is essentially arid subtropical thorn forest on the slopes of a small mountain range known locally as the Sierra de Alamos. This forest is quite deciduous, except for a few elements in the bottoms of arroyos with continuous water. The canopy is at about 15-20 ft., with occasional emergents such as Conzattia sericea, Ceiba acuminata, and Bursera semirouba. The understory is dense and dominated by species of Acacia. Morning glory trees (Ipomoea arborescens) and a large columnar cactus (Pachycereus pecten-aboriginum) are scattered throughout the area.

Sites where L. nivalis and L. sanborni can both be taken in mist nets are few and far between. One such was near Los Amoles, San Luis Potosi, where we netted on 28 July, 1983. We set seven nets over a large earthen tank. The tank was too large to net effectively and was surrounded by a large bank on two sides, a grassy area on the third, and a mesquite bosque on the fourth. The natural vegetation in the area was low desert scrub with scattered agave and cacti. We caught a single L. nivalis before midnight, and despite intermittent rain between 2 and 4:30 AM, we took 6 more L. nivalis and 2 L. sanborni in the early morning hours.

The only other area of direct sympatry was at Lago de Tequesquitengo in Morelos. There we netted both species as they emerged from Cueva del Cerro. The ratio was 14 L. sanborni to 2 L. nivalis. The cave is in the middle of a plowed field, but the surrounding area is extremely rocky, rolling hills with sparse vegetation. The only emergent trees were Crescentia alata, Ceiba sp., and a strangler fig (Ficus).

C. **Associated Bat Species:** The following list contains only those species that were taken with L. sanborni during the course of this survey:

Pteronotus davyi	Davy's Naked-backed Bat
Pteronotus parnellii	Parnell's Mustached Bat
Macrotus waterhousii	Waterhouse's Leaf-nosed Bat
Leptonycteris nivalis	Mexican Long-nosed Bat

Glossophaga soricina	Pallas' Long-tongued Bat
Natalus stramineus	Mexican Funnel-eared Bat
Myotis velifer	Cave Myotis

Population Biology

A. **Demography:** A decline in populations of this species was reported by Hayward and Cockrum (1971) years ago. They pointed out that the well known colony at Colossal Cave had already disappeared by that time. Howell and Roth (1981) suggested that that colony may have numbered as many as 20,000 at one time.

Despite searching every known U.S. locality, we found L. sanborni in only a single cave in southeastern Arizona. That cave is located in a very remote area on private property in the mountains near Patagonia in Santa Cruz County. The surrounding vegetation is Upper Sonoran, wtih scattered pinyon and juniper, grassy understory, and occasional agaves. There is a small earthen cattle tank nearby, which may provide a ready source of drinking water. The cave contains an impressive colony of 10,000-20,000 Myotis velifer, and about 500 L. sanborni. The bats are concentrated in an upper crack, and large guano deposits have avalanched off of an underlying shelf to hamper penetration into the far reaches of the cave. I censused the entire cieling area by crawling along the shelf and scanning every cluster with binoculars and headlamp to verify identification.

In 1973, Donna Howell and Stephen Humphrey visited all known U.S. localities of L. sanborni and counted a total of 135 animals (Howell and Roth, 1981). Then, in 1976 and 1977, Howell repeated the effort, and located about 200 animals in the Patagonia area. Apparently this colony is a fairly secure one, in contrast to all of the other historical roosts of this species in the U.S.

By far the largest roost of L. sanborni we located was found in a sea cave off the coast of Jalisco near the small town of Chamela. The cave is a series of three large cracks carved by tidal surges from a small rocky island called Isla San Andres. The Island is well protected by its location, and by the difficulty of landing a small boat on or near it without being smashed by the constant wave motion. Each of the three cracks is jammed full of bats along the top and sides, and the bottoms are filled with guano above the tidal surge line. The conditions make estimating population sizes extremely difficult. Direct counts were impossible, and my estimates are based on density and coverage of the various clusters, and a rough estimate of the numbers of each of the three species contained in the cave. I estimated there were a total of 10,000 to 30,000 bats of three species: Leptonycteris sanborni, Pteronotus davyi, and Pteronotus parnellii. There were more Leptonycteris than the other two combined, and my best guess is on the order of 15,000 L. sanborni. We netted extensively in the area

along the coast near the cave, but although we caught bats of many species, we never took a Leptonycteris. This leads me to believe that the animals from this cave are foraging further inland, in the rolling foothills extending back from the coast. The cave may provide such ideal roosting conditions that the animals commute long distances to feeding areas.

Although early descriptions of localities often prove extremely difficult to use, we managed to locate a number of caves that had harboured significant numbers in the past, judged by the number currently in collections.

The Chiricahua Mountains in Southeastern Arizona and the Peloncillo Mountains in Southwestern New Mexico held colonies of this species in a number of natural caves and mine tunnels in the past. A thorough search of the area in 1985, including visits to all known roosts, was fruitless. Although we found no active roosts of Leptonycteris in either the Chiricahua or Peloncillo Mountains, they do regularly visit hummingbird feeders at the Spofford residence in Portal. The bats arrive in mid-June, before the agaves are flowering, and come in to the feeders every night until July when the agaves are flowering. They come back in late July and stay as late as October in some years. The bats, which also include unknown numbers of Choeronyteris mexicana, consume up to a gallon and a half of sugar water each night. This suggests that significant numbers still exist, but must be using roosts that are so far unknown.

A similar situation exists in Ramsey Canyon in the Huachuca Mountains. There, The Mile Hi preserve maintains a series of hummingbird feeders. The managers, Debbie and Tom Collazo, explained to us in the summer of 1985 that the bats were such a nuisance in early and late summer that they had to lower the feeders to the ground each night so the bats would not drain them. I was there in July when the bats do not visit the feeders, probably due to the abundance of natural food (agaves) at that time. At my request, the Collazos ran an experiment for me on the night of August 28, 1975, when the bats were frequenting the feeders once again. They measured the amount taken by the bats during the night and found it to be 307 ounces.

Extrapolating from Howell (1979), it is possible to estimate the total number of bats needed to use this much "nectar" in a single night. Howell (1979) suggests that bats spend about 20 minutes foraging during a single bout, and that they ingest about 4 grams of nectar during that time. The total time spent foraging is three hours, resulting in a total consumption of 36 grams per night. This amounts to slightly over one ounce per bat per night. If these figures are close to reality there must have been nearly 300 bats using the feeders at The Mile Hi during the night of 28 August 1985. This seems like a high estimate, but clearly there is a population of nectar feeding bats remaining in the Ramsey Canyon area.

The fact that these bats will use artificial feeders suggests an intriguing series of studies that could be done to gather additional information about them. Further study of the Ramsey Canyon and Portal bats would be extremely helpful in documenting the current status of U.S. populations.

The single most suggestive bit of evidence that this species may be declining more rapidly than any general decline in bats was found at a small mine west of Alamos, Sonora. When we visited the site on 12 June 1984 there were no live Leptonycteris, but we found a recently dead mummy of L. sanborni. Other species were still living in the mine, and we found individuals of Desmodus rotundus, Glossophaga soricina, and Choeronycteris mexicana. This scenario of finding evidence of recently dead Leptonycteris combined with other species that seemed to be doing well was reminiscent of what we found with L. nivalis at a cave in Guerrero earlier the same year. Perhaps there is some agent causing species specific problems for these bats.

B. **Reproductive Biology:** Surprisingly little is known about reproduction in this species. Pregnant females have been found as early as March in Mexico (Hayward and Cockrum, 1971). Because some of these animals were near term, I suspect that they were a resident population that breeds much earlier than do the migratory animals that move into Arizona in early May. The animals that do go to Arizona

are in advanced stages of pregnancy by the time they arrive.

The length of gestation is unknown. Hayward and Cockrum (1971) suggested either four and one half months, based on the Mexican animals found pregnant in March, or perhaps as long 9 months based on animals found pregnant in August. I suspect that neither of these estimates is correct. I think it more likely that this species has a gestation period of around two months like most other species of bats (Wilson, 1979).

Females have only a single young per litter, and parturition times have been recorded as early as 6 May and as late as 26 May. Pregnant females were obtained on 26 May as well, so the parturition period may not be well synchronized. The young begin flying at about 4 weeks and are accomplished by eight weeks (Hayward and Cockrum, 1971). Cockrum and Ordway (1959) found pregnant females in August in Arizona, and speculated that those animals migrated to Mexico and established Fall maternity colonies there. The implication would be that the animals were polyestrous, except that the pregnant animals they found apparently had not lactated during June and July.

C. **Population Ecology:** Ecological relationships of L. sanborni are poorly known (Hayward and Cockrum, 1971). Day roosts seem to be limited mainly to caves and mine tunnels. Clearly they commonly form large colonies in caves, but smaller groups roosting in mine tunnels are

also common. In both of these types of roosts, the bats frequently are found quite near the entrance, in the twilight zone. There are a few reports of night roosts in man made structures.

Hoffmeister and Goodpaster (1954) found a night roost inside an infrequently used horse barn located in an oak woodland at the mouth of Miller Canyon in the Huachuca Mountains, Cochise County, Arizona. In fact, the series collected there formed the basis for the description of L. sanborni (Hoffmeister, 1957). The group consisted of about half adult females and the other half immatures of both sexes.

L. sanborni frequently shares cave roosts with other species of bats, including some which form huge colonies like Myotis velifer and Tadarida brasiliensis. Ammonia concentrations of over 1,000 ppm were recorded in one such roost at Cueva del Tigre near Carbo, Sonora (Studier et al., 1967).

These bats leave a characteristic yellow stain on the rocks near cave roosts and on the cave floor and walls. The droppings are watery and somewhat sweet smelling. Mist-netted animals frequently are covered with yellow pollen. Howell (1975, 1979) conducted a most interesting set of experiments with this species over a span of several years documenting their intimately co-evolved system with agaves. All available evidence points to agaves as being the favored food in the northern part of

the range, but other species are undoubtedly used in other areas and at other times of year.

By analysing pollen grains from stomach contents, Hayward and Cockrum (1971) showed that the bats shifted from a diet of Saguaro to Agave in early summer, and then may have switched to fruit after the agaves were finised blooming.

Natural mortality patterns are unknown, and the only records are essentially anecdotal in nature. Hayward watched a Cooper's hawk (Accipiter cooperi) attacking a bat that he had released outside during the day. Cockrum found a mummyfied individual impaled on an Ocotillo stalk near a roost entrance (Hayward and Cockrum, 1971).

Some indication of longevity can be obtained from banding records of bats at Colossal Cave (Hayward and Cockrum, 1971). One adult female was at least 9 years old when recaptured for the last time, and another was at least 7 years old. Although this is a long life span for a small mammal, it is in keeping with other species of bats.

This species is parasitized by a variety of small batflies, mites, and ticks. Webb and Loomis (1977) summarized reports of batflies of the families Nycteribiidae (Basilia antrozoi) and Streblidae (Trichobius sphaeronotus), mites of the families Macronyssidae (Macronyssus unidens), Trombiculidae (Speleocola davisi), and Spinturnicidae (Periglischirus

vargasi), and ticks of the family Argassida (ornithodoros rossi). Colonial species frequently are heavily parasitized, so this parasite burden may be normal for the roosting habits of this species.

The migratory habits of L. sanborni are presumed primarily on circumstantial evidence (Hayward and Cockrum, 1971). The sexes tend to be separate while the bats are in the U.S., and the separation may occur even before the spring migration northwards. Hayward found an all female colony at La Aduana in March, but whether or not they migrated north or remained resident is unknown. The bats arrive in southern Arizona in early May, and females begin to give birth within a week or two of arrival. Records from Cueva del Tigre in Sonora suggest that the bats arrive there about a month earlier and remain about a month later in the Fall.

Females show fidelity to maternity roosts, as evidenced by banding records on file at the University of Arizona and the National Museum. The animals begin leaving traditional maternity roosts as early as late July, when the young are capable of flight. They do not completely leave the country until as late as October.

Baker and Cockrum (1966) pointed out the ecological separation between most populations of the two species of Leptonycteris. Although we now know of several sites of sympatry, in general L. sanborni is an inhabitant of lower regions west and south of the Sierra Madre Occidental frequently below 5,000 ft, and as low as sea level.

Land Ownership and Management Responsibilities The single known colony remaining in the United States is on private land in Santa Cruz County, Arizona. Feeding aggregations occur regularly at bird feeders at Portal in the Chiricahua Mountains and at Ramsey Canyon in the Huachuca Mountains. Part of Ramsey Canyon is a preserve managed by the Nature Conservancy. The majority of the area around Portal is private land.

By far the bulk of the range lies in Mexico. The lands on which the bats roost and forage are owned by a broad spectrum of private and public interests. Management responsibilities are unlikely to be taken too seriously by Mexican authorities given the current economic climate of that country.

Management Practices To my knowledge, no management has been directed towards L. sanborni in the United States, and management of this species in Mexico is equally non-existent. The finding that they can be attracted to artificial feeders opens a variety of management possibilities. Further research into this, and into the provision of artificial roosts in protected reserves would be worthwhile

Evidence of Threats to Survival

A. **Present and Potential:** The US range is reasonably secure but much of the range in Mexico is subject to habitat

disturbance and destruction from an ever-increasing human population. For a colonially roosting species, the most devastating potential danger is in the destruction of cave and mine roosts for whatever reason. This could result in the loss of large numbers of animals at a time. A catastrophe at the only remaining known U.S. roost would devastate the remaining population in this country. Vandalism is a continuing problem with cave roosting bats, and in Mexico, the general public frequently confuses all bats with vampires, and practices destructive control programs that kill all species in a cave.

A more nebulous, but perhaps also more pernicious, threat lies in the continued loss of populations of agaves, which serve as the major food source, at least in the northern parts of the range. Howell and Roth (1981) suggested that the linkage between the bats and the plants is such that a downward spiral could be triggered by a decline in the population of either.

Unfortunately, documenting an overall decline in agave populations throughout the range of L. sanborni is a difficult task indeed. However, the potential threat provided seems clear from Howell's studies.

B. Overutilization: There is no commercial utilization and the only direct kill is due to vandalism or misdirected control programs. Although there are considerable numbers of specimens in museum collections,

scientific collecting is not a significant threat to otherwise undisturbed populations.

C. **Diseases and Predation:** Bats in general are susceptible to a variety of diseases, but there is no evidence to suggest that any are having a direct effect on current population sizes. Predation pressure on this species is unknown, but is generally believed to be light on most species of bats.

D. **Inadequacy of Existing Regulatiory Mechanisms:** Existing regulations appear to be adequate in the United States. There are no regulations in Mexico other than those imposed on scientific collectors. The scientific collecting regulations are misguided in the sense that such collecting probably constitutes no threat to current populations. Regulations against control programs directed against bats might be useful in controlling the incidental kill when roosts of suspected vampires are destroyed.

II. ASSESSMENT AND RECOMMENDATIONS

General Assessment The bulk of the U.S. population of *L. sanborni* is adequately protected due primarily to its inaccessibility to the general public. That population, however, is a tiny fraction of the entire population, and the bulk of the range is in Western Mexico, and around the Southern end of the Mexican Plateau. Although much of this area is still in a natural state, constant inroads of habitat destruction by an increasing human population pose a threat that is difficult to quantify given our current state of knowledge about this species.

Federal Status Recommendation I recommend that, pursuant to the Endangered Species Act of 1973, as amended, *Leptonycteris nivalis* be listed as Threatened.

Recommended Critical Habitat None.

Conservation/Recovery Recommendations

A. **General Recovery Recommendations:** None are needed for U.S. populations. The Government of Mexico should be urged to undertake a complete survey of potential roosts of this species, and to effect protection for those sites harbouring large colonies.

B. Monitoring: The Fish and Wildlife Service should set up a regular monitoring program to census the summer population in Arizona. Such a program should include a check of the number of individuals visiting the regular artificial feeding stations in the Chiricahua and Huachuca Mountains, and an annual census of the cave colony in Santa Cruz County.It would be very useful to design the program in such a way that approximate dates of arrival and departure could be recorded each year.

A similar monitoring program should be instituted at selected sites in Mexico. It would be best if such a program were handled exclusively by the Mexicans, but that is unlikely. The FWS should institute a cooperative monitoring program such as the one currently done for Peregrine Falcons. Selected roosts could be visited at appropriate times of year by a team consisting of a U.S. biologist and one from Mexico.

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Table 1. Localities where Leptonycteris sanborni was observed during the status survey.

Date	Site	Situation	Number
07/29/83	NUEVO LEON: near Los Amoles	Net	2
05/21/84	MORELOS: near Tequesquitengo	Both	14
05/30/84	JALISCO: near Chamela	Roost	15,000
07/15/85	ARIZONA: near Patagonia	Roost	500

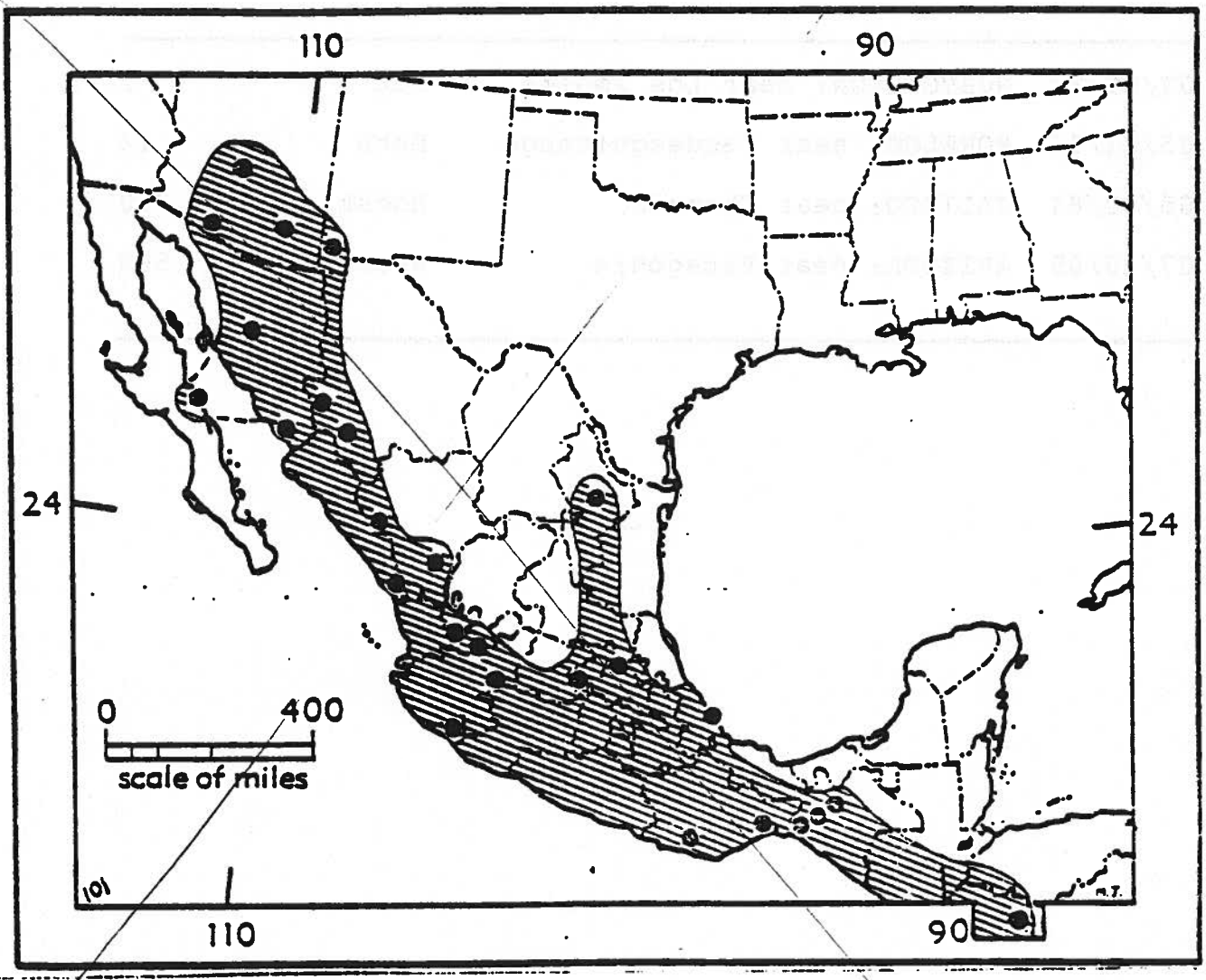

Figure 1. Distribution of Leptonycteris sanborni.

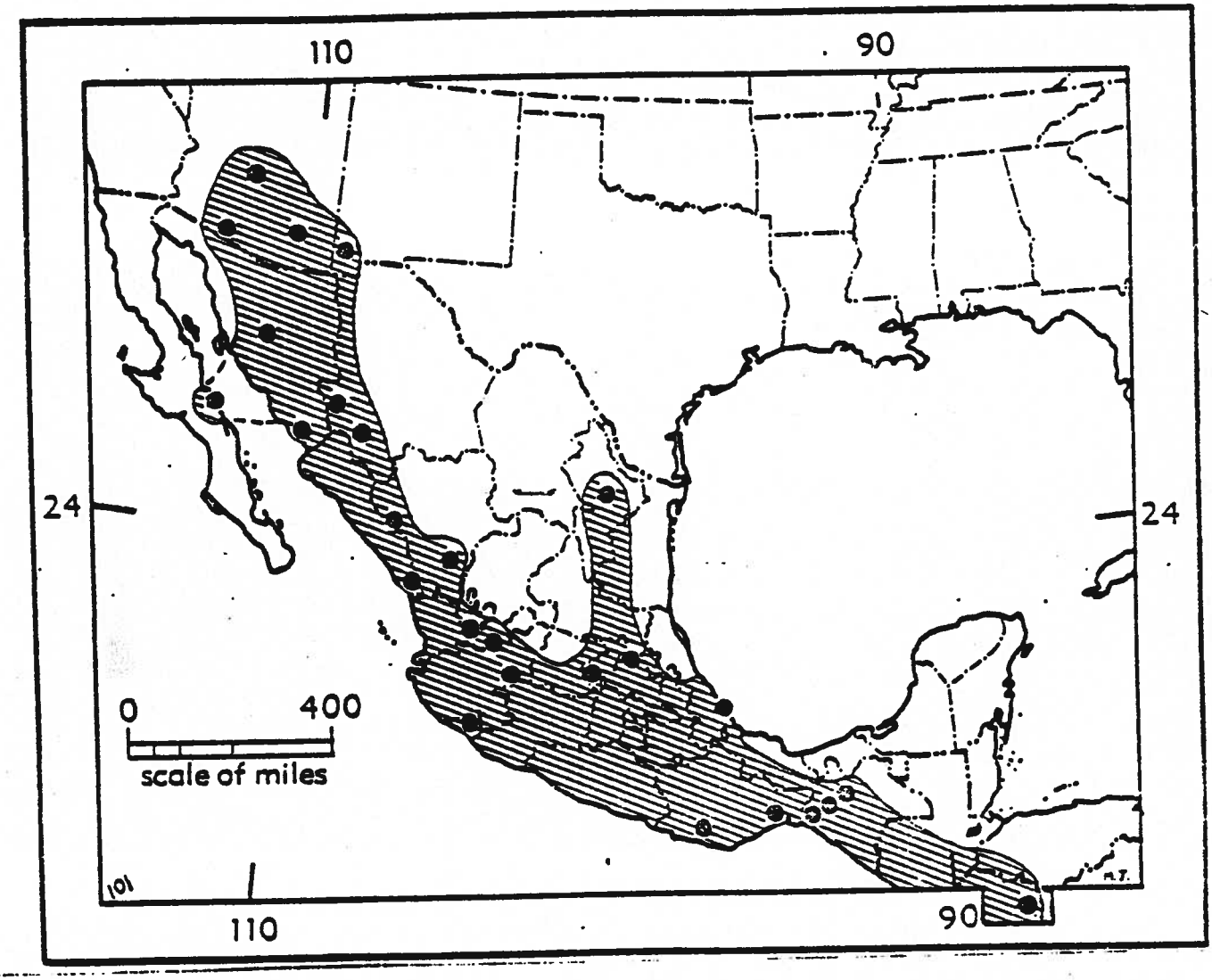

Figure 1. Distribution of Leptonycteris sanborni.